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COAL-MINE FATALITIES IN KENTUCKY IN 1934

BY

JOSEPH F. DAVIES AND H. B. HUMPHREY

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COAL-MINE FATALITIES IN KENTUCKY IN 1934[1]

By Joseph F. Davies[2] and H. B. Humphrey[3]

A practical way of preventing accidents is to determine the causes of those of frequent occurrence and provide in every possible way against their recurrence. The following summary compiled from reports on fatal accidents in the coal mines of Kentucky for 1934 gives data on some of the causes of accidents and suggests measures for their prevention. Similar summaries and reviews have been issued in recent years by the Bureau of Mines[4] for this and other States.

ACKNOWLEDGMENT

The information used in compiling this summary was obtained from the monthly reports issued by John F. Daniel, chief of the Kentucky Department of Mines and Minerals, and made available through his courtesy and cooperation.

FATALITIES

All fatal accidents reported in and about the coal mines of Kentucky for 1934 have been included in this review. Accident reports for Kentucky are published annually by the State Department of Mines and Minerals and for all States by the United States Bureau of Mines. A few accidents in domestic mines and in mines not under the supervision of the State Department of Mines and Minerals are not chargeable directly to the mining industry. The revised mining law, effective July 1, 1934, placed more of the small mines under the jurisdiction of the State inspectors. Supervision should promote safer

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1 The Bureau of Mines will welcome reprinting of this paper, provided the following footnote acknowledgment is used: "Reprinted from U. S. Bureau of Mines Information Circular 6868".

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4 Davies, Joseph F., and Humphrey, H. B., Coal-Mine Fatalities in Kentucky in 1931, 1932, and 1933: Inf. Circ. 6809, Bureau of Mines, 1934, 12 pp.
Miller, A. U., Review of Illinois Coal-Mine Fatalities for 1933: Inf. Circ. 6813, Bureau of Mines, 1934, 35 pp.
Herbert, C. A., Review of Coal-Mine Fatalities in Indiana During the last 3 months of 1932 and the Calendar Year 1933: Inf. Circ. 6828, Bureau of Mines, 1935, 22 pp.

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working practices, as the proportion of accidents from these mines is high for tonnage produced and men employed; this fact is noted in reports from other States in which small mines operate without supervision of the inspection department.

Tables 1 and 2 compare production and fatality rates of Kentucky mines with those of 7 other principal coal-mining States for 1933 and 1934. As in past years, Kentucky stands fourth in tonnage mined. Although Illinois mined more coal in 1934, Kentucky (as in 1933) was third in man-hours worked, probably because of greater use of mechanical mining in Illinois. Kentucky was also third in the number of fatalities; however, the preliminary rates for 1934 given in table 1 show Kentucky and West Virginia with the same accident rate on a man-hour basis. Virginia, with a serious explosion disaster, had a still higher rate. The final figures for 1933, included for comparison, show the best record for the whole coal-mining industry experienced since accurate records have been available. The tentative figures for 1934 show a less favorable fatal-accident record, which probably will be increased as missing reports are received. Pennsylvania, Ohio, and Illinois maintained the good record of the previous year; Alabama, West Virginia, and Kentucky showed increases in accident rates which were, however, not unfavorable when compared with the rates for 1931 and 1932. The average for the bituminous mines of the United States for 1934 will be much better than for any year except 1933, according to present figures. The figures in tables 1 and 2 were compiled by the Employment Statistics section of the Bureau of Mines through the courtesy of W. W. Adams, Supervising statistician; they give the accidents and tonnage reported up to March 1935. The figures for 1934, of course, are subject to later revision.

TABLE 1. - Fatality rates of principal coal-producing States, 1933-34 1

State	Fatalities per million tons		Fatalities per million man-hours	
	1934	1933	1934	1933
Pennsylvania (bit.)	1.78	1.82	0.94	0.96
Ohio.....	2.11	2.76	1.20	1.57
Alabama.....	3.44	2.63	1.27	.97
Illinois.....	2.13	2.06	1.60	1.54
West Virginia.....	2.86	2.68	1.84	1.72
Kentucky.....	3.07	2.77	1.84	1.65
Virginia.....	4.29	2.81	2.42	1.59
Indiana.....	(2)	2.76	(2)	2.61
United States Average (bit.)....	2.59	2.50	1.53	1.48

1/ Figures for 1933 are revised and final; figures for 1934 are preliminary and subject to revision.

2 Reports incomplete.

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TABLE 2. - Tonnage, man-hours, and fatalities for principal coal-mining States, 1934

State	Tonnage 1934	Man-hours[1] 1934	Fatalities 1933	Fatalities 1934
Pennsylvania (bit.)	89,223,000	168,345,000	144	159
Ohio	20,842,000	36,694,000	54	44
Alabama	9,596,000	26,005,000	23	33
Illinois	40,905,000	54,540,000	77	87
West Virginia	98,190,000	152,706,000	253	281
Kentucky	38,068,000	63,980,000	100	117
Virginia	9,100,000	16,135,000	23	39
Indiana	14,820,000	15,699,000	33	(2)
United States Total (bit.)	358,385,000	606,421,000	833	927

1 Man-hours for each State were estimated by using the 1933 production per man-hour per State against the estimated tons given above.
2 Reports incomplete.

CAUSES OF ACCIDENTS

The number of fatal accidents by causes in Kentucky and in the United States is shown in table 3. The percentage of the total due to each cause also is given to indicate which causes were chiefly responsible for fatal accidents.

Falls of roof and coal caused 58 fatalities in Kentucky in 1934, but due to the large number of haulage fatalities the slate falls were only 46.8 percent of the total. When the fatalities from this cause in mines not under State supervision are subtracted the number is about the same as for 1932 and 1933, the improvement since 1931 being retained. Fatalities from falls of slate averaged about 57.6 percent of the total for all States combined.

Underground haulage accidents caused 21.0 percent of the fatalities in the coal mines of Kentucky in 1934 compared with 15.3 percent for the preceding 3-year period, and 17.6 percent for the United States in 1934. This continuation of the increase in fatalities from this cause which was noted in 1933 is significant. Undoubtedly haulage accidents are far too frequent, and steps can and should be taken to correct the conditions responsible. These factors are discussed in the section on haulage accidents.

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TABLE 3. - Fatalities by causes in coal mines of Kentucky and the United States, 1934

Cause of accident	Kentucky		United States	
	Number killed	Percent	Number killed	Percent
Underground:				
Falls of roof or coal	58	46.8	535	57.6
Haulage	26	21.0	161	17.3
Gas explosion	2	1.6	37	4.0
Fire	5	4.0	8	.9
Machinery			17	1.8
Electricity	9	7.2	56	6.0
Explosives	3	2.4	25	2.7
Coal bumps	8	6.5	8	.9
Miscellaneous			22	2.4
Total underground	111	89.5	869	93.6
Outside:				
Explosives	7	5.7		
Haulage	3	2.4		
Machinery	1	.8		
(Sunstroke)				
(Falling timber)	2	1.6		
Total surface	13	10.5	59	6.4
Grand total	124	100.0	928	100.00

TABLE 4. - Fatalities according to occupation in Kentucky coal mines, 1934

Occupation	Number killed	Percentage of total number of employees in each occupation[1]	Percentage killed of total employed in each occupation[1]
Loader or miner	61	60.0	0.24
Machineman and helper	14	7.0	.47
Motorman	5	5.0	.25
Coupler or trip rider	21	5.0	1.00
Driver	1	.5	.35
Trackman and timberman	6	2.0	.52
Shot firer and driller	3	2.0	.43
Laborer	2	3.0	.15
Foreman and assistant	5	3.0	.50
Surface crew and miscellaneous	6	10.0	.12
Total	124	97.5	.30

1/ Approximate.

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Fires and explosions caused 7 deaths in Kentucky compared with 45 for the United States, or 5.6 percent of the fatal accidents against an approximate average of 4.8 percent for the country as a whole. The only comment is that all such accidents are preventable.5

Nine fatalities (7.2 percent of the total) resulted from electric shock from low trolley wires; the average for the United States was about 6 percent. These figures represent an increase for both Kentucky and the United States over the preceding 3 years.

Explosives caused 3 deaths underground or 2.4 percent of the total, which is about the same as that for all the States averaged.

Coal bumps caused 8 fatalities (6.5 percent of the total) by direct violence. This problem is proving as serious as had been anticipated and fully warrants the studies that are being made.

On the surface an inexcusable explosives disaster cost 6 lives and haulage accidents 3 more; other accidents from various causes brought the number killed on the surface to 17.

OCCUPATIONS

In an attempt to discover the weak spots in accident prevention, the percentage of workers killed in each occupation proves interesting and valuable. The fatalities are grouped according to occupation in table 4. The number employed in the various occupations was estimated from representative figures compiled by the authors from mines in different sections of the State. Although not exact, these ratios are considered close enough for comparison of the risks. The approximate percentage killed of the total number of employees in each occupation is shown in the last column.

The work of the coupler or trip rider was so unsafe under conditions prevailing in 1934 that twice as many were killed in relation to number employed as in any other occupation. The ratio was about 1:100, compared with an average for all of 3:1,000. For the preceding 3 years the average for trip riders was 4:1,000. The next most hazardous occupations were those of trackmen and timbermen and machinemen; the percentages killed were 0.52 and 0.47 respectively. For the preceding 3-year period the corresponding rates were 0.32 and 0.43.6

The same percentage (about 0.24 percent) of the loaders and miners was killed as in the preceding 3-year period.

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5 Harrington, D., and Fene, J. J., Coal-Mine Explosions and Fires in the United States During the Fiscal Year Ended June 30, 1934: Inf. Circ. 6819, Bureau of Mines, 1935, 16 pp.

6 Davies, Joseph F., and Humphrey, H. B., Coal-Mine Fatalities in Kentucky in 1931, 1932, and 1933: Inf. Circ. 6809, Bureau of Mines, 1934, 12 pp.

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Other occupations with high fatality rates were: Shot firers and drillers, 0.43 percent; and firemen and bosses, 0.50 percent.

Motormen were on a par with loaders; the percentage killed was about 0.25.

Sixty-one percent of the loaders were killed by falls of slate, 7 percent by haulage, 13 percent by coal bumps, and 3 percent by electricity; about 20 percent of the trip riders were killed by falls of slate; 51 percent by haulage, and 5 percent by electric shock; 45 percent of the machinemen were killed from haulage or tramming machines, 20 percent from explosives, and 15 percent from electric shock.

About 0.12 percent of all surface workers and 0.30 percent of all surface and underground men were killed.

AGES AND EXPERIENCE

The ages and years of experience of those killed in and around coal mines were tabulated and averaged. The average age of the victims was again 34 years, the same as for the preceding 3-year period. Only 10 (8 percent) were under 21 years, and 16 (13 percent) were over 50.

Without data on the number of men of these ages employed, the conclusion to be reached from these figures is that age has little to do with accidents, but added years probably have not brought added safety since more old men were killed than boys. In an attempt to estimate the significance of this question, other factors to be considered are impaired physical ability with increasing age, rashness of youth or inadaptability of age, and the relative number of old or young in hazardous jobs.

The average experience of all the men killed was 13 years, the same as for the preceding 3-year period. Only about 1 percent had worked less than a year in the mines, whereas 25 percent had worked 20 to 40 years, which should have added to their ability to work safely. Apparently the kind of experience and supervision has much more to do with producing safe workmen than mere length of service.

DEPENDENTS AND NATIONALITY

The average number of dependents was about 2.6 for each death, a smaller number than in the preceding years. About 23 percent had no dependents, which is a much larger proportion than in past years; 12 percent had 6 to 9 each, considerably fewer than in the past 3 years; 65 percent had families of 1 to 5.

Tabulation of the victims by nationality shows that 86 percent were native white Americans, 11.5 percent negroes, and 25 percent foreign-born; this is a considerable increase in the ratio of native white Americans and may indicate an increased proportion of native white labor employed over that of the 3 preceding years. Without data on the number of each nationality employed and their occupational risks no significance can be attached to these figures as regards relative safety.

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FATAL ACCIDENTS IN 1934

The conditions that contributed to the 124 fatal accidents listed in table 3 were studied and with the causes and a summary of the recommendations for avoidance of similar accidents are grouped in the following tables.

Falls of Roof

During the year only 1 fatal accident was reported from falling coal; 56 fatal accidents, causing 58 fatalities (47 percent of the total), were reported from falls of rock from the roof or brushed ribs. These accidents have been grouped according to cause in table 5.

TABLE 5. - Fatalities from falls of coal and slate in Kentucky, 1934

Cause	Number of accidents	Number killed
Lack of inspection or attention to loose slate	20	20
Lack of systematic timber requirements	14	15
Caught by slate after knocking timber	12	13
Incompetent men in small mines	4	4
Inadequate supervision (direct cause)	3	3
Fell under slate while pulling it down	2	2
Disregard of instructions	1	1
Total	56	58

1. The direct cause of 20 accidents with 1 death each was failure to inspect the roof before working or going under loose or doubtful roof. In some mines regular inspection was not customary or required, being left to the worker; in others certain general rules had been made, but regular observance was neglected. Again, the section or mine foreman was assigned to the duty of inspecting the roof before or after the men started work, depending on when he came around, but no one was responsible for the safety of the place before men entered. A number of deaths resulted from falls on haulageways which were not inspected and had not been scaled or timbered in a way to make them safe for travel. Most of these accidents involved faulty supervision.

2. The next most frequent cause of accidents was lack of a systematic timbering system requiring a minimum amount of support in all places and the setting of additional timbers where needed. There were 14 accidents from this cause and 15 deaths from falls in places where the timbering was left to the judgment of the miner as to how and when the posts should be set or to the special directions of the foreman on visits at varying intervals. Such matters should not be left to the men having the least ability in the organization or to directions which cannot be given at the proper time or which may not be strictly observed. This is almost entirely a matter of proper and safe supervision.

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3. In 12 instances rock fell when timbers were removed without using a timber puller or without setting other timbers to take the places of the ones removed, and 13 men were killed. Often machinemen were the victims of these accidents. Deaths from this and the two preceding causes increased over those occurring in 1933, in spite of the warning and efforts of the State Department of Mines and Minerals to stop the practice of removing timbers unless safe means were employed. In some instances the roof was tested and found drummy, but a chance was taken and the posts were removed.

4. In four instances in small, uninspected mines not under the State inspectors, inexperienced or careless men were caught by falls of roof in places which they knew were dangerous. These have been grouped separately because they occurred in small unregulated mines.

5. In three accidents inadequate or incompetent supervision was the direct as well as the general cause. One foreman allowed men to work in a place he had pronounced dangerous but failed to have it made safe; another section foreman allowed a man to work in a place without timbers, although the rules required certain timbers in each place; the third accident occurred in pillar work which required careful inspection and timbering but on the day of the accident had not been visited by an official.

6. In two instances men were caught by slate which they were taking down. One slipped and fell as the rock came loose, and the other took a chance and tried to pass under while the rock was being pulled. To reduce such accidents the supervising officials should make sure that dangerous jobs are handled only by experienced, careful men.

7. In one mine an experienced man pointed out a dangerous piece of roof to his foreman and was told to set three safety posts before doing anything else. The foreman went on, and the man put off setting the posts and was killed. Although the man deliberately disregarded orders, the foreman shares the responsibility because of his failure to stay and see that the place was made safe.

Place of fatal accidents from falls of slate is shown in table 6.

TABLE 6. - Place of fatal accidents from falls of slate, 1934

Place	Number of fatalities	Percentage of total fatalities from falls of slate
At working face:		
Room	27	46
Pillar	12	21
Entry	8	14
On roadway or entry	10	17
In room	1	2
Total	58	100

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The preponderance of fatalities in rooms over pillar workings indicates the proportionately small amount of pillar work being done. Eighty-one percent of the fatalities occurred at the working face compared with 74 percent in 1933. Rock falls on haulageways totaled 18 percent in 1933 and 17 percent in 1934. The location of most of the accidents bears out the contention that supervision is the means of preventing most of these accidents.

TABLE 7. - Occupation of men killed by falls of slate, 1934

Occupation	Number killed	Occupation	Number killed
Loaders	37	Foremen and assistants	3
Machine crew	6	Laborer	1
Haulage crew	5	Shot firer	1
Trackmen and timbermen	5		
		Total	58

In view of the smaller number of men employed as machinemen, haulagemen, and bosses, the number killed shows that these occupations are more hazardous than loading. The machinemen as a whole have a "chance-taking" attitude which must be changed before this type of accident can be reduced to any great extent. The haulagemen were killed because of failure to inspect and make safe the roof over roadways. Trackmen and timbermen often had bad places in which to work, but virtually all of them could have saved their lives by inspecting the roof and being reasonably cautious.

Prevention of Accidents from Roof Falls

A few well-known safety measures would have prevented most of the fatal accidents from falls of roof. Observance of safety measures specifically required in the mining law would have saved a few lives, and adoption of previous special recommendations of the inspectors would have saved others.

According to the causes given in the reports and recommendations, the following ordinary safety measures would have prevented many of the fatalities:

1. Inspect roof frequently and regularly.

2. Allow no one to pass or work under doubtful roof, except as may be necessary to make it safe.

3. Establish a definite minimum requirement for setting timbers.

4. Before removing timbers set others to take their places. If they cannot be replaced test the roof before knocking a post out and in most instances use a prop puller, rail, or long pole.

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5. Make supervision and discipline of first importance. If the cooperation of men who disregard instructions cannot be obtained they should not be allowed to work.

6. Scale or timber bad roof only by or in the presence of capable bosses or men especially qualified for this work.

Coal Bumps

The coal-bump hazard has grown more serious in recent years and is being studied carefully by the State Department of Mines and Minerals, the United States Bureau of Mines, and the safety department of the Harlan County Coal Operators' Association, cooperating with several of the operating companies most seriously affected. Eight deaths resulted directly from five coal bumps. Other fatal accidents were thought to be due in part to less severe bumps. Several Mines experienced bumps of all degrees of violence without fatalities because no one happened to be in the line of violence. An investigation to determine ways of avoiding coal bumps should be continued in the affected areas. Not only are the bump and its violence dangerous, but a disastrous explosion might result from ignition of the dust cloud stirred up and the gas liberated by the pulverizing of large amounts of coal.

Investigations show that bumps are due to sudden release of stresses in the overlying strata, which are of great depth in these mountain ridges and are often largely unsupported because of the sharp ridges and ravines. The room-and-pillar system of mining often creates conditions that cause bumps, particularly if a long straight pillar line is not carefully maintained at all times and no stumps or "faulted" areas are left behind. One great trouble has been that the main roof would not break but would arch over and concentrate weight on the pillar faces or fracture suddenly with a shock like that of an earthquake and crush exposed pillars with great violence.

In general, investigators agree that a system of mining that would avoid the danger of bumps should be planned and carried out carefully. Such systems are recommended by the State Department of Mines and Minerals and by engineers who made the studies for the United States Bureau of Mines and the Harlan County coal operators, as well as by others.1

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1 Jones, D. J., Wilder, H. N., and Maurice, J. F., Mountain Bump in the Coal Fields of Harlan County, Ky.: Kentucky State Dept. of Mines and Minerals, Geol. Div., ser. 3, Bull. 1.
Rice, G. S., Bumps in Coal Mines of the Cumberland Field, Kentucky and Virginia - Causes and Remedy: Rept. of Investigations 3267, Bureau of Mines, 1935, 36 pp.; Bumps in Coal Mines - Theories of Causes and Suggested Means of Prevention or of Minimizing Effects: Am. Inst. of Min. and Met. Eng., Tech. Pub. 609, 1935, 23 pp.; Occurrence of Bumps in the Springhill No. 2 Mine of the Dominion Coal Co., Ltd.: Nova Scotia Dept. of Public Works and Mines, 1924.
Hall, R. D., Coal Bursts from Working Faces at Gallup, N. Mex.: Coal Age, vol. 30, 1926, p. 637.
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Hudspeth, H. M., Forces Induced by Extraction of Coal: Trans. Inst. Min. Eng., vol. 85, 1933; Coll. Guard., vol. 146, 1933, pp. 541 and 582.
Colliery Guardian, Bumps in South Staffordshire Thick Coal: May 26, 1933, pp. 756-758.

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Fatal Haulage Accidents

Haulage accidents caused 27.4 percent of the fatalities in Kentucky coal mines in 1934. The 29 fatalities are grouped in table 8 according to the direct causes chiefly responsible.

The marked increase in fatal haulage accidents has been due largely to failure of both management and employees to adjust safe working practices to changed working conditions. Haulage equipment and systems suitable to older methods and hours of work usually cannot be adapted safely to increased territory and work with less idle time, unless the following requirements are met:

1. Adequate equipment and time given to each part of the haul.

2. A regulated and supervised haulage system.

3. Discipline and strict compliance with needed safety regulations.

Increased haulage accidents for 1934 have been reported from other important coal-mining States. Officials making these reports believe that properly maintained equipment, system, and discipline must be required.

TABLE 8. - Fatalities from haulage accidents in Kentucky coal mines, 1934

Cause	Number of accidents	Number killed
Wrecks and collisions	7	7
Run over getting on or off trips or cage in motion	7	7
Crushed between top and locomotive - lack of clearance	6	6
Run over while riding or walking in front of pushed trip	5	5
Trying to couple cars on the "fly"	1	1
Leg crushed in locomotive gears	1	1
Caught between cars and timber	1	1
Run over while blocksetting	1	1
Total	29	29

1. Wrecks and collisions caused seven fatalities. A loader in attempting to move a locomotive let it run away and was killed; an electrician operating a motor ran up a slate fall; a locomotive left the track on a curve because of excessive speed and caught a loader against the rib; a locomotive ran into part of a loaded trip which had broken loose and stopped in a swag; a coupler was caught between a wrecked car and timbers; and a surface worker was killed when a loaded car jumped the track at a tipple. Haulage equipment should be operated only by those previously certified for the job.

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2. The dangerous but common practice of getting on and off moving trips resulted in seven fatalities in 1934, one of which was on a cage in a shaft. Two reasons for taking this chance of death or being crippled appear possible - to save the company's time or to save personal time and bother and ignore commonsense rules.

3. Six men were killed by being crushed between the top and cars or locomotives. In two instances the men were inexperienced or incompetent. No one should be allowed to act as coupler or trip rider unless previously certified for the job. Lack of clearance, requiring haulagemen to squeeze into places not intended for riding space, was a factor in nearly every instance. This lack of clearance has been tolerated so long that it has come to be regarded as usual practice or even a necessary condition; however, several mines in the district find it more efficient and economical, as well as safer, to brush the roof of haulageways in low coal.

4. Another common practice, long condemned as dangerous, is walking or riding in front of pushed trips. There were 5 fatal accidents from this cause in 1934.

5. The other fatal accidents, all from causes which have been proved and branded as dangerous, resulted from coupling cars on the fly, backpoling, coupling cars in a place where there is not enough side clearance, and unguarded gears in a locomotive.

TABLE 9. - Occupation of men killed in haulage accidents, 1934

Occupation	Number killed	Occupation	Number killed
Motormen	3	Trackmen	1
Couplers	14	Machinemen	3
Driver	1	Rock-Duster	1
Loader	4	Electrician	1
Laborer	1	Total	29

The fact that only 17 of the 29 men killed in haulage accidents were members of haulage crews indicates a need for more careful regulation of all haulage practice and selection and maintenance of personnel.

Fatalities From Electric Shock

There were 9 fatalities from electric shock in 1934, more than in any previous year. Eight of the 9 deaths were due to low unguarded trolley wires and 1 to contact with a live uninsulated part of a locomotive which would have had no current in it if it had been properly inspected and maintained.

Fatalities resulted from contacts with the trolley wire when: A machineman rerailing a truck straightened up under the wire; a miner got out of a man-trip on the wire side; a coal loader helping to move some motors at a sidetrack stood up in the deck and touched the wire; a coupler helping to repair a locomotive stood up under the wire; a mine superintendent straightened

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up at a parting while operating a locomotive; a motorman touched the wire while replacing the pole; a cable hook caught on a hanger while nipping and a machineman was pulled into the wire; and a coupler touched the wire while crossing over bumpers to rerail a car.

In all instances the wire was low and unguarded; the accidents would not have happened if proper clearance or guards had been provided. The Mine Safety Board of the United States Bureau of Mines recommends guarding all wires less than 6½ feet above the rail. With greater top clearance the wire could be placed at least high enough not to be a constant menace, and it could be guarded at the most needed points - sidings and switches. These are also examples of fatalities that occurred when uncertified men were allowed to operate haulage equipment.

Need for First-Aid Training

Accounts of the deaths from electric shock show that 5 of the 9 men might have been saved had first aid been given promptly by men with ordinary training. Unnecessary loss of life is strong justification for the requirement in the revised mining law of Kentucky that all men working in and about mines shall have first-aid training. These fatalities occurred in mines where such training had not been given.

Fatalities from Explosives

During 1934 there were 3 fatalities underground from unsafe practices in the use of explosives. A boy working in a small, unventilated domestic mine was suffocated by black-powder fumes when he entered 3 hours after blasting. A driller and his helper were fatally burned by pellet powder ignited by a short circuit in an improperly insulated drill cable. The supply of powder was in an open box on the truck.

A machineman after leaving the mine was struck by a piece of iron when a blast was fired in a waste dump; he failed to seek cover when warned.

Six persons were fatally burned by an explosion of 15 kegs of black blasting powder in a small building used as storehouse and office of a small truck mine. The powder was ignited by a pistol shot during an argument. The storage of explosives in any but a properly constructed magazine was a violation of the mining law. The powder had been placed there that morning.

Black blasting powder was involved in 9 of the 10 fatalities; the Bureau of Mines recommends that only permissible explosives be used in coal mines; evidently the recommendation is a sensible one.

Gas Explosion and Fire

A machine crew cut through the face of a heading which was approaching an old mine without waiting for drill holes to be placed in advance as had been ordered; the gas released was ignited by open lights or by electric arc

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from the machine. The machine runner died from afterdamp and the helper from burns 4 days later. There was no violence. In addition to the need of permissible equipment in gassy mines, some stronger precautions were needed to see that the drill holes were placed and the cutting through done with the necessary care.

A small mine fire started by blasting with pellet powder caused smoke and fumes which asphyxiated five men when the usual shift was allowed to enter the mine. Blasting should be done with permissible explosives only, and no one but properly organized fire-fighting crews should enter a mine in which there is fire until the fire has been sealed or extinguished and normal ventilation restored.

Other Surface Fatalities

A carpenter was caught in a conveyor belt and pulley when he attempted to apply belt dressing with the belt in motion. A mechanic died of sunstroke while working on a fan engine outside the fan house; apparently his life might have been saved if first aid had been given. A mine official was killed by a falling timber while a tipple was being repaired.

CONCLUSIONS

The accident record of the coal mines of Kentucky did not improve during 1934, as it might have done had there been the same amount of attention given to safety regulations as in the preceding year. Even if the natural hazards - low roof clearance and bumping pillars - are not changed, insistence on precautions in inspecting and timbering doubtful roof, and regulation and discipline in haulage and in electrical installations and usage will go far toward reducing the loss of life which has occurred year after year.

Cooperation and compliance with the present mining law will do much to bring about safer working standards. This cooperation is necessary from all within the industry and those dependent upon it, including mine managers and officials, mine employees, and all others concerned in the welfare of the coal miners.

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